Communications on
PURE AND APPLIED MATHEMATICS

A JOURNAL ISSUED BIMONTHLY BY
THE COURANT INSTITUTE OF MATHEMATICAL SCIENCES
NEW YORK UNIVERSITY

VOLUME XXVII • 1974

An Interscience® Publication
Published by JOHN WILEY & SONS
New York–London–Sydney–Toronto

Statement of ownership, management, and circulation (Act of August 12, 1970; Section 3685, Title 39 United State Code).

1. Date of filing: October 1, 1974.
2. Title of Publication: COMMUNICATIONS ON PURE AND APPLIED MATHEMATICS.
3. Frequency of issue: bimonthly.
4. Location of known office of publication: John Wiley & Sons, Inc., 605 Third Avenue, New York, New York 10016.
5. Location of headquarters of general business offices of publisher: 605 Third Avenue, New York, New York 10016.
6. The names and addresses of publisher, editor, and managing editor:

   Publisher: John Wiley & Sons, Inc., 605 Third Avenue, New York, New York 10016.
   Editor: None.
   Managing Editor: Fritz John, Courant Institute of Mathematical Sciences, 251 Mercer Street, New York, New York 10012.

7. Owner: John Wiley & Sons, Inc., 605 Third Avenue, New York, New York 10016.

   The following is a list of stockholders owning or holding 1% or more of John Wiley & Sons, Inc. stock as of September 12, 1974:

   Cynthia W. Darby, Box 651, Bridgehampton, New York 11932; Hamilton Darby, Box 651, Bridgehampton, New York 11932; John P. Gilbert, exec. estate of Julia Wiley Gilbert, c/o Wells Fargo Bank Trust Division 37165, P.O. Box 3820, San Francisco, California 94120; Edward P. Hamilton, 605 Third Avenue, New York, New York 10016; W. Bradford Wiley & Francis Lobdell, Trustees, Elizabeth W. Hamilton Trust, 605 Third Avenue, New York, New York 10016; Edward P. Hamilton, Trustee under will of Elizabeth Wiley Hamilton, c/o Gifford, Woody, Carter & Hays, 1 Wall Street, New York, New York 10005; I. M. Kolthoff, University of Minnesota, School of Chemistry, Minneapolis, Minnesota; Eric S. Proskauer & Charles H. Lieb, Trustees, u/a by Jenny R. Proskauer, 220 Central Park South, New York, New York 10019; Francis Lobdell & William J. Seawright, Trustees, f/b/o Deborah Elizabeth Wiley, c/o John Wiley & Sons, Inc., 605 Third Avenue, New York, New York 10016; Cynthia W. Darby & Julia Gilbert, Trustees, under will of Kate R. Q. Wiley, c/o Gifford, Woody, Carter & Hays, 1 Wall Street, New York, New York 10005; Francis Lobdell & William J. Seawright, Trustees, f/b/o Peter Booth Wiley, c/o John Wiley & Sons, Inc., 605 Third Avenue, New York, New York 10016; Francis Lobdell & William J. Seawright, Trustees, f/b/o William Bradford Wiley II, c/o John Wiley & Sons, Inc., New York, New York 10016; Edward P. Hamilton & Cynthia Wiley Darby, Trustees, under will of William O. Wiley, c/o Gifford, Woody, Carter & Hays, 1 Wall Street, New York, New York 10005; Adele E. Windheim, 8 Dundee Road, Larchmont, New York; John H. Norris & William H. Paul, Trustees, u-a f/b/o Carmen R. Runyon, Jr., 427 Madison Avenue, New York, New York 10022; W. Bradford Wiley & E. P. Hamilton, Trustees for Edward P. Hamilton Foundation, c/o John Wiley & Sons, Inc., 605 Third Avenue, New York, New York 10016; Mrs. Rosamond R. Pennywitt, 49 Bristol Place, Bay Head, New Jersey 08742; Drexel Burnham & Co., 60 Broad Street, New York, New York; Mass. State Carpenters Fund, Hermitage Bldg., 1 Militia Drive, Lexington, Massachusetts 02173; Bankers Trust Company, 16 Wall Street, New York, New York 10015; National Bank of Detroit, Woodward Avenue, Detroit, Michigan; Riggs National Bank of Washington, D.C., 1508 H. Street, N. W., Washington, D.C.; Manufacturers Hanover Trust Company, 350 Park Avenue, New York, New York 10022.

8. Known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amounts of bonds, mortgages, or other securities: None.
9. For optional completion by publishers mailing at the regular rates (Section 132.121, Postal Service Manual) 39 U. S. C. 3626 provides in pertinent part: "No person who would have been entitled to mail matter under former section 4359 of this title shall mail such matter at the rates provided under this subsection unless he files annually with the Postal Service a written request for permission to mail matter at such rates."
   In accordance with the provisions of this statute, I hereby request permission to mail the publication named in Item 1 at the reduced postage rates presently authorized by 39 U. S. C. 3626.
   (Signature and title of editor, publisher, business manager, or owner) Michael Harris, Vice-President.
10. Not applicable.
11. Extent and nature of circulation

	Average no. copies each issue during preceding 12 months	Actual no. of copies of single issue published nearest to filing date
A. Total no. copies printed (*net press run*)	1850	1850
B. Paid circulation		
1. Sales through dealers and carriers, street vendors and counter sales	—	—
2. Mail subscriptions	1608	1608
C. Total paid circulation	1608	1608
D. Free distribution (*including samples*) by mail, carrier or other means		
1. Samples, complimentary, and other free copies	10	10
2. Copies distributed to newsagents, but not sold	—	—
E. Total distribution (*sum of C and D*)	1618	1618
F. Office use, left-over, unaccounted, spoiled after printing	232	232
G. Total (*sum of E & F should equal net press run shown in A*)	1850	1850

I certify that the statements made by me above are correct and complete: MICHAEL HARRIS

Communications on

PURE AND APPLIED MATHEMATICS

CONTENTS

Volume XXVII, Nos. 1–6, 1974

Number 1, January

BEALS, RICHARD and FEFFERMAN, CHARLES: Spatially Inhomogeneous Pseudodifferential Operators, I 1
JENNINGS, GRAY: Discrete Shocks 25
GRAD, H., KADISH, A. and STEVENS, D. C.: A Free Boundary Tokamak Equilibrium 39
BOUTET DE MONVEL, LOUIS and TREVES, FRANCOIS: On a Class of Systems of Pseudodifferential Equations with Double Characteristics 59
NEUMANN, PETER M.: A Note on Cyclic Difference Sets 91
BAUMSLAG, GILBERT: A Remark on the Multiplicative Group of the Division Ring of a Poly-Infinite-Cyclic Group 93
GARDNER, CLIFFORD S., GREENE, JOHN M., KRUSKAL, MARTIN D. and MIURA, ROBERT M.: Korteweg- de Vries Equation and Generalizations. VI. Methods for Exact Solution . 97
MCKEAN, H. P.: Correction to: Selberg's Trace Formula as Applied to a Compact Riemann Surface 134

Number 2, March

JONES, B. FRANK, JR., and KEMPER, JOHN T.: The Local Character of Kernel Functions in Axiomatic Potential Theory . . 135
NEWMAN, CHARLES M.: Zeros of the Partition Function for Generalized Ising Systems 143
BEALS, RICHARD: Spatially Inhomogeneous Pseudodifferential Operators, II 161
DUISTERMAAT, J. J.: Oscillatory Integrals, Lagrange Immersions and Unfolding of Singularities 207

Number 3, May

JAMESON, ANTONY: Iterative Solution of Transonic Flows over Airfoils and Wings, Including Flows at Mach 1 283
PINSKY, MARK A.: Stochastic Stability and the Dirichlet Problem . 311

MOCK, M. S.: On a Sufficiently Fine Mesh for Quasilinear Elliptic Equations 351
ZEHNDER, EDWARD J.: A Remark About Newton's Method . 361
CONLEY, CHARLES C. and SMOLLER, JOEL A.: On the Structure of Magnetohydrodynamic Shock Waves 367
JOHN, FRITZ: Formation of Singularities in One-Dimensional Nonlinear Wave Propagation 377

NUMBER 4, JULY

PAO, YOUNG-PING: Boltzmann Collision Operator with Inverse-Power Intermolecular Potentials, I 407
FOLLAND, G. B. and STEIN, E. M.: Estimates for the $\bar{\partial}_b$ Complex and Analysis on the Heisenberg Group. 429
LARSEN, EDWARD W.: A Functional-Analytic Approach to the Steady, One-Speed Neutron Transport Equation with Anisotropic Scattering. 523
SPRUCK, JOEL: Gauss Curvature Estimates for Surfaces of Constant Mean Curvature 547
PAO, YOUNG-PING: Boltzmann Collision Operator with Inverse-Power Intermolecular Potentials, II 559
CORRECTIONS 583

NUMBER 5, SEPTEMBER

BOUTET DE MONVEL, LOUIS: Hypoelliptic Operators with Double Characteristics and Related Pseudo-Differential Operators . . 585
PAPANICOLAOU, G. C. and KOHLER, W.: Asymptotic Theory of Mixing Stochastic Ordinary Differential Equations 641
POLLACK, RICHARD M., SHAPIRO, HAROLD N. and SPARER, GERSON H.: On the Graphs of I. Katai 669

NUMBER 6, NOVEMBER

HOFFMAN, DAVID and SPRUCK, JOEL: Sobolev and Isoperimetric Inequalities for Riemannian Submanifolds 715
STUX, IVAN: On the Uniform Distribution of Prime Powers . 729
GROSSMAN, EDWARD H.: Units and Discriminants of Algebraic Number Fields 741
FRIEDRICHS, K. O.: On the Laws of Relativistic Electro-Magneto-Fluid Dynamics 749
Author Index 809
Volume Title Page i
Volume Contents iii

AUTHOR INDEX

Vol. XXVII, 1974

Baumslag, Gilbert: A remark on the multiplicative group of the division ring of a poly-infinite-cyclic group, 93

Beals, Richard: Spatially inhomogeneous pseudodifferential operators, II, 161

—— and *Fefferman*, Charles: Spatially inhomogeneous pseudodifferential operators, I

Boutet de Monvel, Louis: Hypoelliptic operators with double characteristics and related pseudo-differential operators, 585

—— and *Treves*, Francois: On a class of systems of pseudodifferential equations with double characteristics, 59

Conley, Charles C. and *Smoller*, Joel A.: On the structure of magneto-hydrodynamic shock waves, 367

Duistermaat, J. J.: Oscillatory integrals, Lagrange immersions and unfolding of singularities, 207

Fefferman, Charles: see *Beals*, Richard

Folland, G. B. and *Stein*, E. M.: Estimates for the ∂_b complex and analysis on the Heisenberg group, 429

Friedrichs, K. O.: On the laws of relativistic electro-magneto-fluid dynamics, 749

Gardner, Clifford S., *Greene*, John M., *Kruskal*, Martin D. and *Miura*, Robert M.: Korteweg–de Vries equation and generalizations. VI. Methods for exact solution, 97

Grad, H., *Kadish*, A. and *Stevens*, D. C.: A free boundary Tokamak equilibrium, 39

Greene, John M.: see *Gardner*, Clifford S.

Grossman, Edward H.: Units and discriminants of algebraic number fields, 741

Hoffman, David and *Spruck*, Joel: Sobolev and isoperimetric inequalities for Riemannian submanifolds, 715

Jameson, Antony: Iterative solution of transonic flows over airfoils and wings, including flows at Mach 1, 283

Jennings, Gray: Discrete shocks, 25

John, Fritz: Formation of singularities in one-dimensional nonlinear wave propagation, 377

Jones, B. Frank, Jr., and *Kemper*, John T.: The local character of kernel functions in axiomatic potential theory, 135

Kadish, A.: see *Grad*, H.

Kemper, John T.: see *Jones*, B. Frank, Jr.

Kruskal, Martin D.: see *Gardner*, Clifford S.

Kohler, W.: see *Papanicolaou*, G. C.

Larsen, Edward: A functional analytic approach to the steady, one-speed neutron transport equation with anisotropic scattering, 523

McKean, H. P.: Correction to: Selberg's trace formula as applied to a compact Riemann surface, 134

Miura, Robert M.: see *Gardner*, Clifford S.

Mock, M. S.: On a sufficiently fine mesh for quasilinear elliptic equations, 351

Neumann, Peter M.: A note on cyclic difference sets, 91

Newman, Charles M.: Zeros of the partition function for generalized Ising systems, 143

Pao, Young-Ping: Boltzmann collision operator with inverse-power intermolecular potentials, I, 407

——: Boltzmann collision operator with inverse-power intermolecular potentials, II, 559

Papanicolaou, G. C. and *Kohler*, W.: Asymptotic theory of mixing stochastic ordinary differential equations, 641

Pinsky, Mark A.: Stochastic stability and the dirichlet problem, 311

Pollack, Richard M., *Shapiro*, Harold, N. and *Sparer*, Gerson H.: On the graphs of I. Katai, 669

Treves, Francois: see *Boutet de Monvel*, Louis

Zehnder, Edward J.: A remark about Newton's method, 361

Shapiro, Harold: see *Pollack*, Richard M.

Sparer, Gerson H.: see *Pollack*, Richard M.

Smoller, Joel A.: see *Conley*, Charles C.

Spruck, Joel: Gauss curvature estimates for surfaces of constant mean curvature, 547

——: see *Hoffman*, David

Stein, E. M.: see *Folland*, G. B.

Stevens, D. C.: see *Grad*, H.

Stux, Ivan: On the uniform distribution of prime powers, 729